C^3

Installation & Maintenance

Tuesday, November 30, 20047

Table of Contents

1. PURPOSE & SCOPE 4

2. REFERENCED DOCUMENTS 4

3. OVERVIEW 4

3.1. Product description 4

4. C^3 MAJOR ELEMENTS 5

4.1. Block Diagram 5

4.2. Hardware 6

4.3. Software 6

4.4. Modes 6

5. MECHANICAL INSTALLATION 7

5.1. Overview 7

5.2. C^3 Unit Mechanical installation 8

5.2.1. Height of C^3 8

5.2.2. Distance from barrier – Front Plate 9

5.2.3. Distance from barrier – Rear Plate 10

5.2.4. Distance from barrier – Dual Camera per lane ("Stereo") 11

5.3. Detector installation 12

6. ELECTRICAL INSTALLATION 13

6.1. The connection box 13

6.2. Temporary Terminal connection 14

7. SOFTWARE INSTALLATION 15

7.1. Loading the Software components 15

7.1.1. Files are loaded into C^3 unit 15

7.1.2. Windows based application (loaded into the PC) 15

8. TECHNICIAN'S WORKBENCH APPLICATION 16

8.1. Overview 16

8.2. Getting started 16

8.3. Main Window 17

8.4. System test 17
8.4.1. General Test 17
8.4.2. I/O test 18
8.4.3. Image capturing 19

8.5. System calibration 19

8.6. Software updates 20

8.7. Miscellaneous 21
8.7.1. System configuration settings 21
8.7.2. Error log file 23
8.7.3. Gsm error log file 23
8.7.4. Recognition format 24
8.7.5. Twb application log file 24

9. INTERFACING THE C³ 25

9.1. Overview 25

9.2. MicroTerminal 25
9.2.1. Connection 25
9.2.2. Settings 25

9.3. GSM Terminal 25
9.3.1. Safety precautions for the user 25
9.3.2. Components 25
9.3.3. Installation 26

10. TROUBLE SHOOTING 27

11. SUPPORT AND MORE INFORMATION 28

1.Purpose & Scope

This document provides installation and maintenance information on Compact Car Controller (C^3), a stand-alone vehicle access-control system. This document is intended for system installers and provides all the information required installing and operating the system.

2.Referenced Documents

2.1 C^3 User Manual
2.2 Siemens M20 / M20 Terminal Technical Description

These documents are available in our home page, see last section for details.

3.Overview

3.1.Product description

C^3 is a stand-alone vision-based access-control system for vehicles. It identifies the license plate and automatically opens the gate for authorized vehicles (in the Access-Control mode) or reports on the plate number (in the Monitoring mode).

This revolutionary system is a highly integrated computer/camera/illumination unit that performs all the functions of a License Plate Recognition (LPR) system with its **embedded** Microprocessor and See/Car recognition package.

The unit is easily installed ("2 screws installation") at the entrance to a secured area or parking lot. It automatically turns on the integrated illumination, captures the image, locates the license plate, recognizes the registration number, compares it to an authorization list and opens the gate if the vehicle is authorized (in the Access-Control mode).

Authorized vehicle numbers are stored on the unit's local database (for Access-Control). Users can change the authorization list using the cellular phone, the Internet, a micro-terminal (keyboard and display), or via an external computer. C^3 can also transmit the recognized registration number though RS232 serial line to a printer or display and also as an input to other systems.

This unit is a breakthrough in the LPR market which simplifies the architecture, cost and installation requirements over existing PC-based solutions (such as our See/Lane Windows system). The C^3 unit is "PC-Less" and is more compact and easier to install and use.

4.C3 major elements

4.1. Block Diagram

The C3 access-control system architecture is illustrated in the following diagram. The peripherals on the left side are connected via a single serial port and can be connected only one of each.

On the right side the inputs are power supply (a DC adapter connected to the mains), a sensor (dry-contact indicating vehicle presence, such as a loop detector). The output is the gate relay.

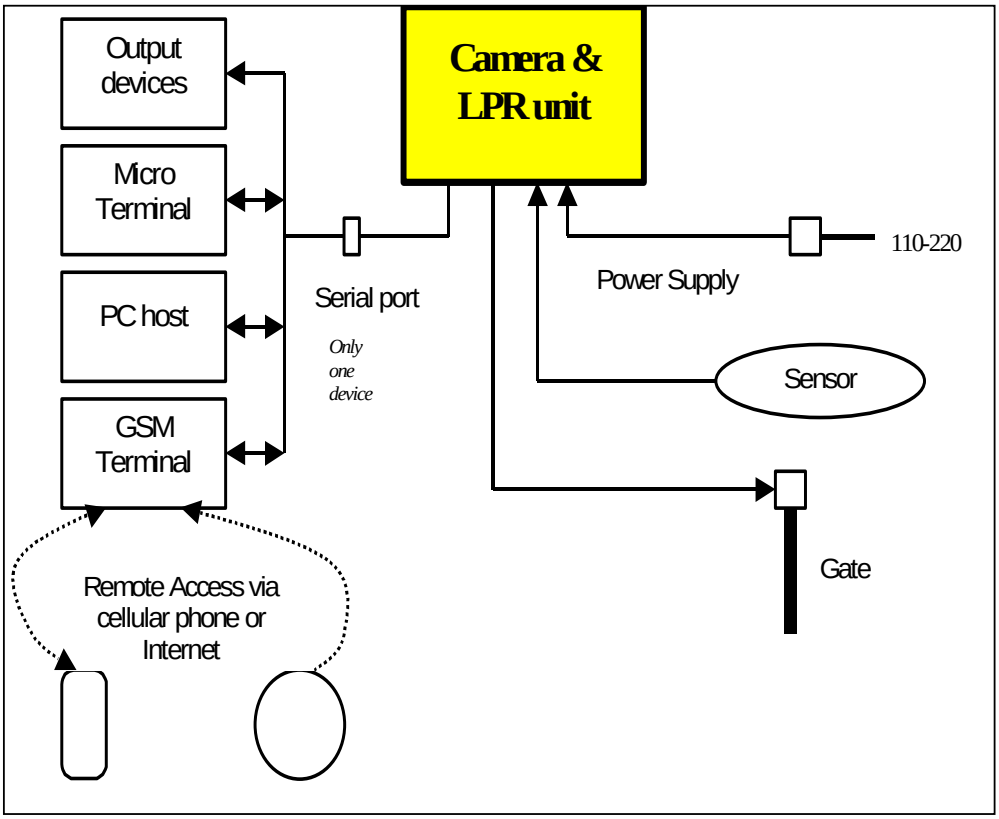


Figure 4.1: C3 Hardware block Diagram

4.2.Hardware

1. C3 - illumination/camera/LPR unit.
2. **Power supply** for C3 (a special 15 VDC, 110-220VAC power supply is used which was qualified to operate with the SCH unit).
3. Vehicle detector (sensor). A standard dry-contact sensor. (can be supplied upon request)
4. Micro-Terminal – handheld terminal (if this interface is ordered; not required for the Monitoring mode)
5. GSM Terminal – M20 Siemens terminal (if this interface is installed)
6. PC Host - any standard PC/laptop, connected by RS232 serial communications, used for normal operation (as an option to update the members list) or used for the installation and maintenance.
7. Gate - the C3 output relay controls the gate's relay to open the gate for the authorized vehicle (only required for the access control mode).

4.3.Software

1. C3 The C3 is loaded with files used to operate the system.
2. PC applications - the PC is used for installation and maintenance, and is one of the optional interfaces, and has several applications on it.

4.4.Modes

The C3 can operate in two modes:

- Access Control - the unit opens a gate for an authorized vehicle (listed in a local database). It can also optionally send the result via rs232232.
- Monitoring Mode - the unit just reports the recognized number via RS232

The selection of the mode is by a configuration parameter. It is pre-configured at the factory and may be changed later.

5.Mechanical Installation

This section describes the physical installation. *A single lane access-control configuration is assumed.*

5.1.Overview

The following figure illustrates how the system is typically installed at the entrance of a secured area. A sensor (such as a loop detector) indicates the presence of the car, which signals the C3 unit (behind the gate's boom) to start a new recognition sequence. The unit identifies the car and if authorized opens the gate.

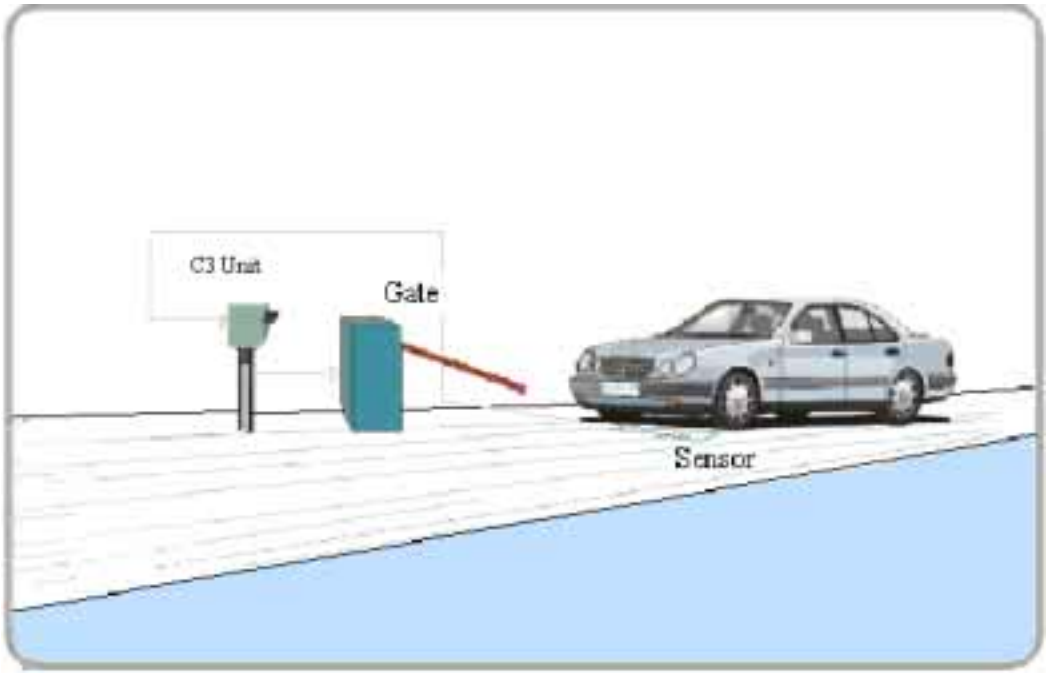


Figure 5.1: a typical installation

For most secured areas the system can control the entrance only, while the exit will be automatically opened for the vehicles exiting the secured area (by a direct connection from the sensor to the gate). Thus a single lane access control will be sufficient to secure the area.

5.2.C3 Unit Mechanical installation

This paragraph assumes that a standard 12mm lens is mounted in the unit for European plates, or 16mm lens for USA size plates.

5.2.1.Height of C3

5.2.1.1.Typical Heights

For most installations, install the C3 unit on a pole or tripod at a recommended height of 1.1 meters (or within 1m-1.2m).

This height optimizes the performance and positions the camera to look *downwards* in order to minimize the sun effect – since most plates are mounted at a height of 0.20 to 1.25 meters.

5.2.1.2.Higher installations

The maximum height is 3 meters. In this case the camera angle should be positioned such that the center of the vertical field of view will be looking at the trigger area. For higher installations please consult with Hi-Tech Solutions.

5.2.1.3.Wall mounting

In case of a wall mounting, secure the unit to the wall at the same height.

5.2.1.4.Anti-Vandalism Enclosure

In case the Anti-Vandalism Enclosure is ordered, install the metal case on the floor.

5.2.2.Distance from barrier – Front Plate

This paragraph refers to installation of the camera in the front of the vehicle.

5.2.2.1.Along the traffic lane

Install the C3 2.5 (or 2m for non-reflective plates / USA size plates) from the barrier, in the direction of traffic, at the side (as near as possible to the lane). *See the illustration below, parameter B.* This corresponds to 5.5 meters (or 4.5 meters for non reflective plates / USA size plates) from the line of the detection of the front of the car (parameter A).

The following diagram shows this setup (for an access control system).

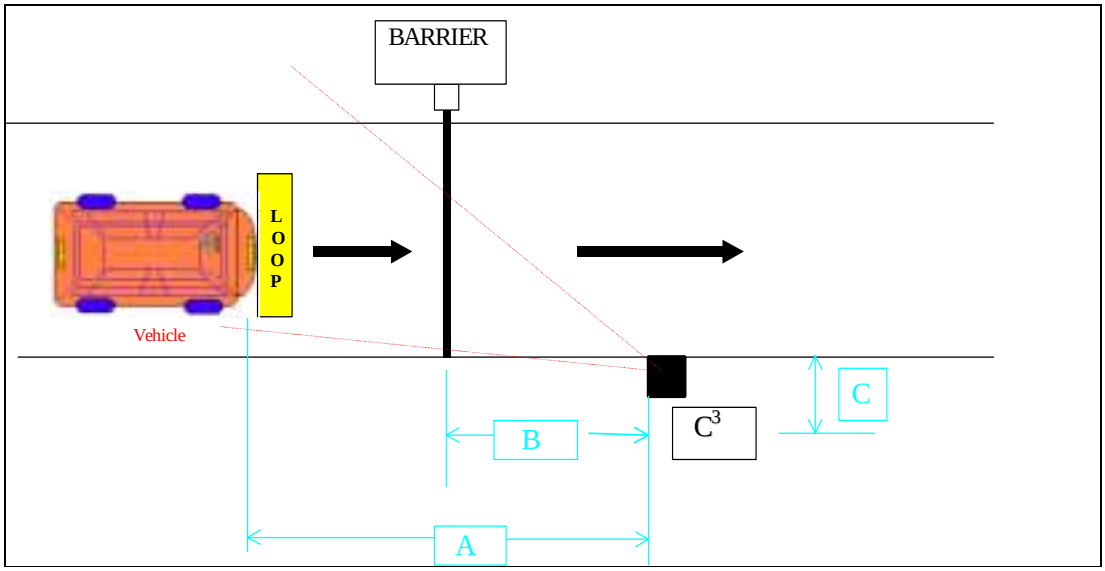


Figure 5.2.1: Front Installation distances *(See text for explanations)*

A possible problem that may be encountered during this installation is that the barrier blocks the effective recognition view zone (This zone is the area from the start of detection plus addition 1.5 meters). In most gates the barrier's height is 0.80 to 1.20 meters so this case will not occur – but in any case it should be tested and avoided.

5.2.2.2.Side of the Traffic lane

Install the C3 as close as possible to the traffic lane, within 0.0 to 0.5 meters. *See the illustration above, parameter C.* This can be constructed on both sides of the traffic lane.

5.2.3.Distance from barrier – Rear Plate

The installation of the camera/illumination unit in the **rear** of the car is possible and may occur in the following cases:

- A front installation is not possible due to traffic lane limitations (such as the front is located in a public area where no installation is permitted)
- There are only rear plates (such as in most of the United States)
- An additional recognition is desired in order to increase the recognition coverage (a dual camera per lane installation - which is supported and described later)

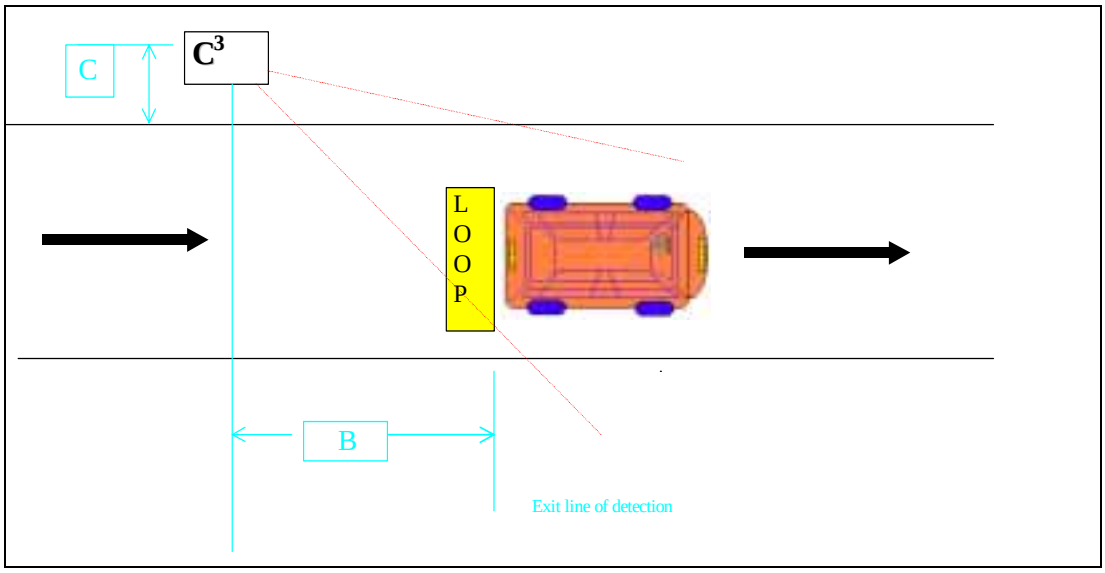


Figure 5.2.2: Rear Installation distances *(See text for explanations)*

The C3 unit should be installed at 4 meters from the loop detection line (parameter B). This translates to about 9 meters or more from the **front** of the car since a typical vehicle is about 4 meters.

The side distance (parameter C) in this installation is identical – 0.0 to 0.5 meters.

5.2.4.Distance from barrier – Dual Camera per lane ("Stereo")

A special setting configures the C3 to operate in dual camera per lane (also called "Stereo" mode). In this mode 2 cameras are used to recognize the car, thus increasing the recognition rate. The application uses special logic that takes **both results.** This mode shares a single sensor per lane to initiate the recognition process.

A typical installation using this mode will be cameras looking at the front and rear plates.

This mode is illustrated in the following illustration. *The typical values are A front = 5 meters and A rear = 9 meters.*

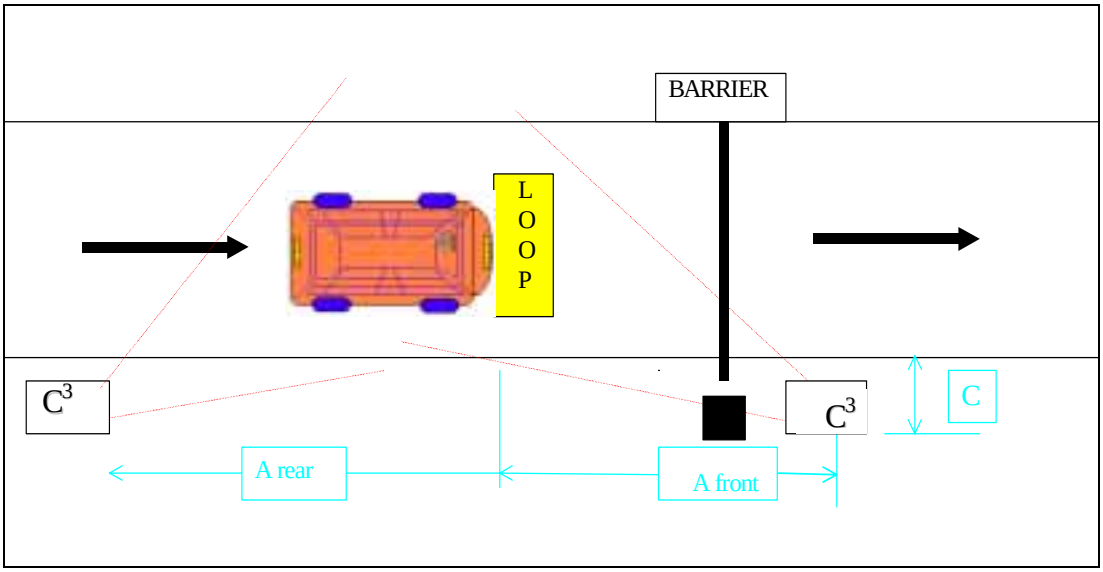


Figure 5.2.3: Front & Rear installation (dual cameras per lane, shared activation)

5.3.Detector installation

This paragraph assumes that the detector is magnetic-loop detector type that can be provided by Hi-Tech Solutions. However, any standard dry-contact vehicle sensor can suffice.

1st. Read the detector's installation guide before installation.
2nd. Install the detector (DET) loop at about 5.5m (or 4.5m for non-reflective plates) from the SCH, on the other side of the barrier (where the vehicle approaches the barrier). *See front-installation illustration, parameter A.*
1st. The loop should be 2m wide, 1m long, 4 turns at least (see note below) placed in the middle of the lane.
2nd. Connect the loop to the detector by twisted pair as required by the manufacturer.
3rd. The detector's plug connects to the I/O card (this is explained below).
4th. Detector Setup (in case of Nortech type):
    1. Use channel 1
    2. Freq. Set to M-L
    3. Sensitivity set to D (Normal)
    4. Mode set to 1 (presense)
5th. Push reset button once after power up (with no vehicle on the loop).
6th. Use normally Open contacts for output (10,11).

Note: In some installations a different loop configuration should be used in case of a bumper to bumper line of moving cars. Please consult with us on solutions for this case.

6.Electrical installation

6.1.The connection box

For the convenience of the installation and maintenance, a special connection box is now designed. *Temporary: the box is replaced by a screw terminal connection - please refer to the drawing in the next page.*

The box is shown in the following illustration (the single lane box):

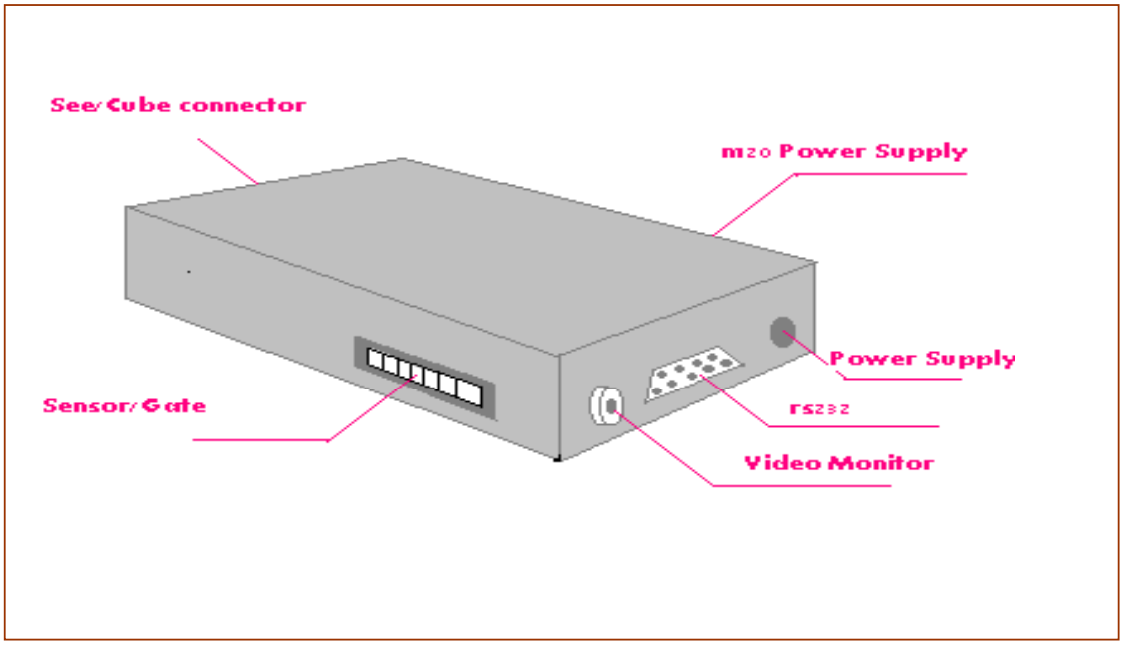


Figure 5.3.1 C3 connection box (single lane)

The box has the following connection nodes:

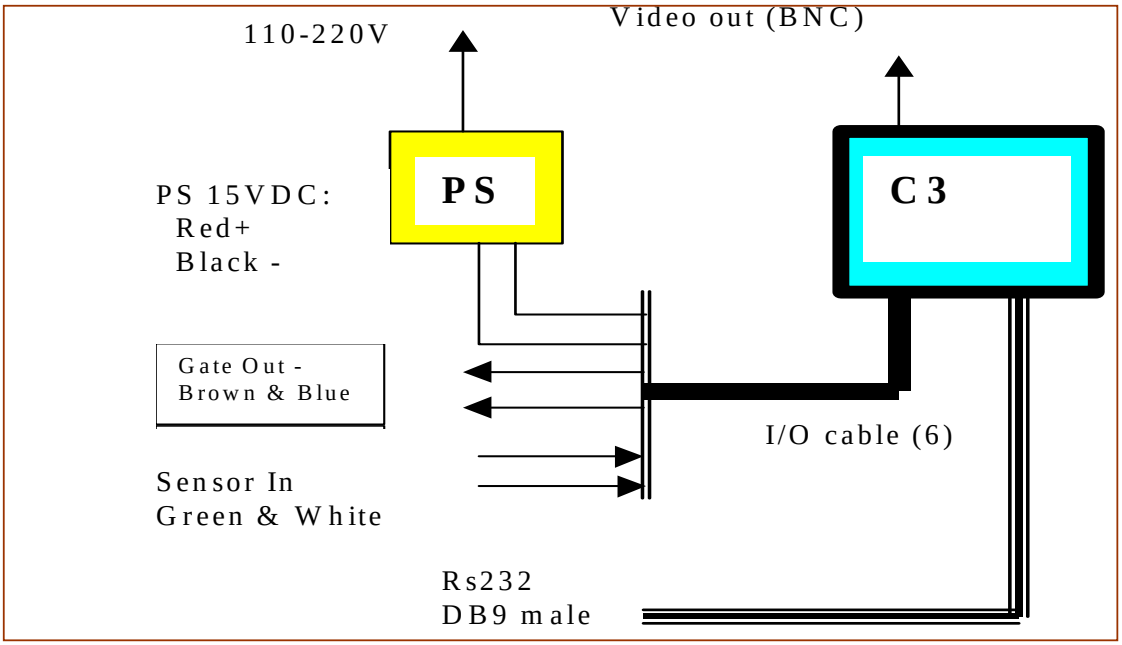
- **C3 connector** (input, output) - that connects the connection box to the C3 unit
- **Sensor/gate** (input, output) - connects to the sensors and gate. There are 2 pair of screws for the gate and for the sensor. Note that the input/outputs are "dry contact" type (i.e., open or short).
- **M20 Power supply** - outputs power to the (optional) GSM interface (output)
- **Power supply** (input). - gets 15VDC from the power supply unit (which feeds from the 100-200VAC mains).
- **RS232 serial connection** (input and output) - connects to the serial interfaces. Some units may require a license plug to be connected first. Pin 9 has +5VDC which is required for the micro-terminal.

- **Video Monitor** (output) - a BNC connection for a video monitor, used for installation.

6.2.Temporary Terminal connection

A temporary terminal connection is shown in the following drawing. *It is used as a temporary connection block until the connection box will be ready for shipments.*

Note that the micro-terminal connection uses a special serial cable with pin 9 as +5VDC.



7.Software installation

7.1.Loading the Software components

7.1.1.Files are loaded into C3 unit

The C3 is shipped with the latest software components already installed in the factory. These are the items:

1. Ccc.exe - main application.
2. Ewb.exe - test and file transfer program.
3. Gsm.exe - GSM terminal connection program. (GSM option only)
4. Kb.exe - Micro-Terminal connection program.
5. Ht.exe - a program to update data base list by Windows Members.exe application.
6. Cars.txt - authorized members data base file. The list is updated by the user (see the user manual).
7. Format.ini - country-specific license plates recognition information.
8. Config.ini - application configuration settings.

7.1.2.Windows based application (loaded into the PC)

1. Members.exe - application to update authorized members data base list. *Reference: C3 User manual.*
2. Twb.exe - technician work bench application. The application purpose is basic testing, system calibration and C3 software updates.

8.Technician's workbench application

8.1.Overview

Twb.exe is an application designed for authorized personal usage only. The application purpose is system basic test, system calibration and software updates. The application requires PC with 586 processor and at least 32 MB RAM, running WIN95/98/Me.

The latest version is available on our support page. Please see details in the last section of this document.

8.2.Getting started

Install C3 utilities package on host PC. You do not need to restart the PC. Connect PC host with C3 Com port by using standard serial cable. Be sure that C3 is in an idle state. *If C3 is in a recognition process the attempt to connect will fail.* Start twb.exe application. The connection dialog will now appear.

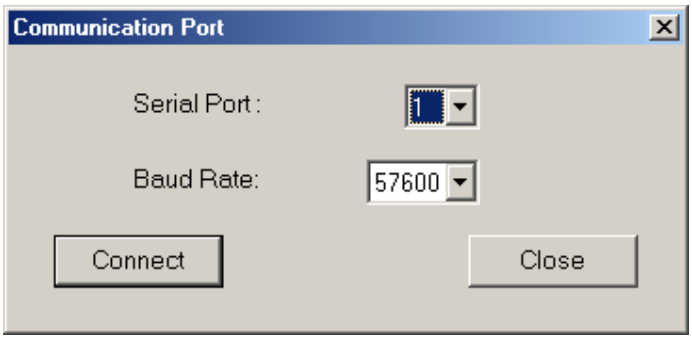


Figure 8.2: Connection dialog

Choose Com port and press Connect button. *Next time the application will show this Com port number automatically.*

8.3.Main Window

The application main window will appear, as shown below:

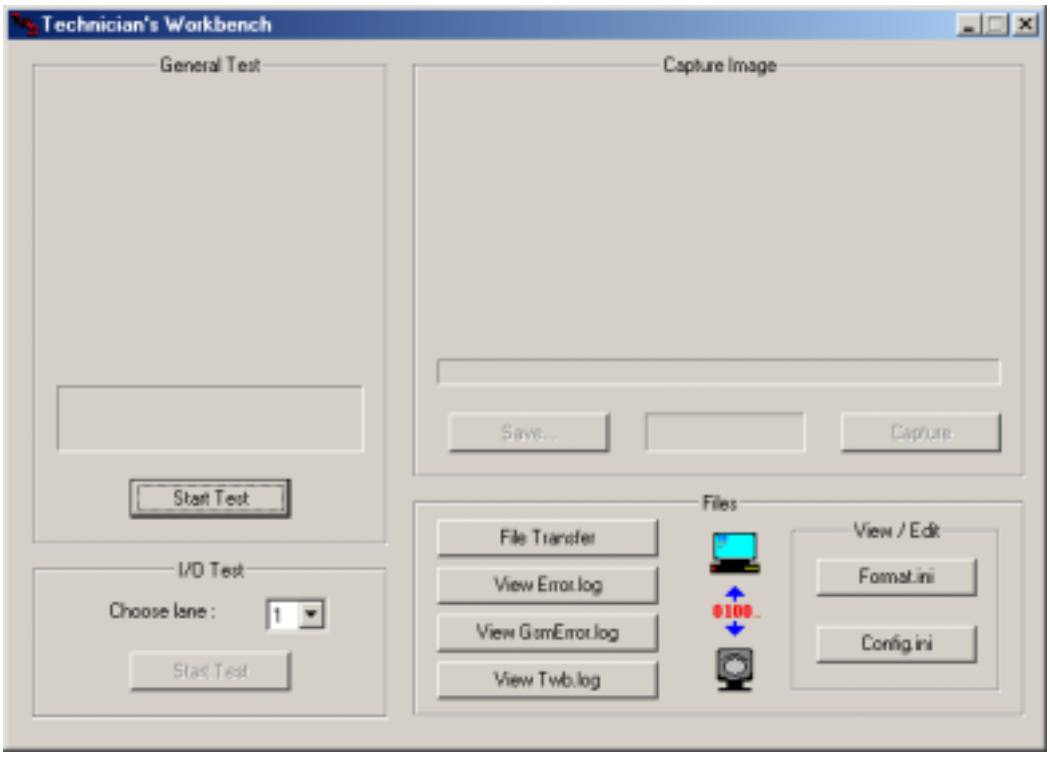


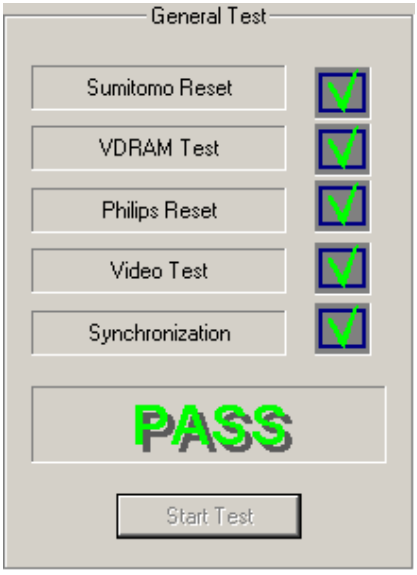
Figure 8.3: Main Window

8.4.System test

8.4.1.General Test

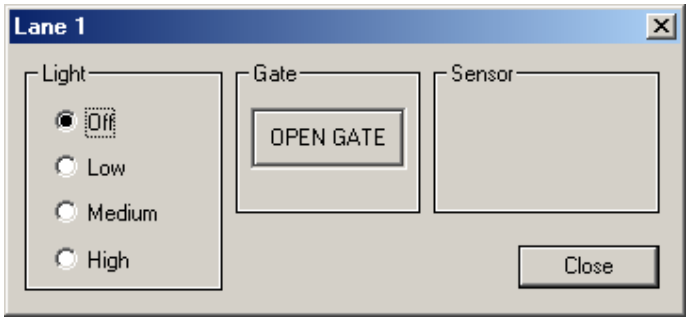
Press General test button to run system basic test. The system has to pass all checks (big "PASS" letters are shown after some seconds). If one of tests (or more) will fail, contact with HI-TECH Solutions technical support.

The following image shows the result of this test:

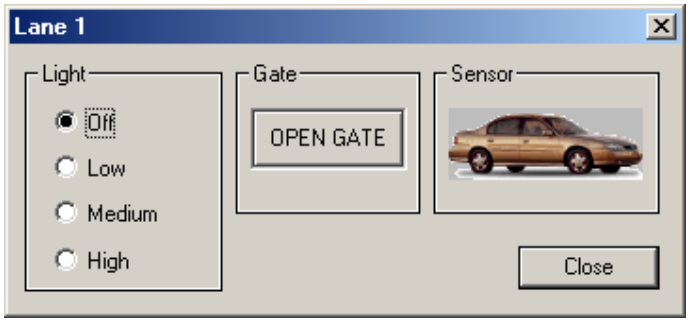


8.4.2.I/O test

Press "I/O test" button. You will see the following dialog:



When a car passes the sensor the car icon will appear on the Dialog:



You can check right gate electrical connection by press "Open Gate" button.
You can manually set the light intensity.

8.4.3.Image capturing

8.4.3.1.Capturing an image

If "General test" finished successfully you can capture images and download them to the PC host. Press "Capture" button. Download progress will shown in the bottom of image area.

NOTE:
1. Image transfer is slow - done by RS232 communication. It takes from 1 minute (in 57600 baud rate) up to 4.5 minute (in 9600 baud rate), so be patient or take a coffee break…
2. Prior to the image capture, set the illumination to a desired level.

8.4.3.2.Recognition zone

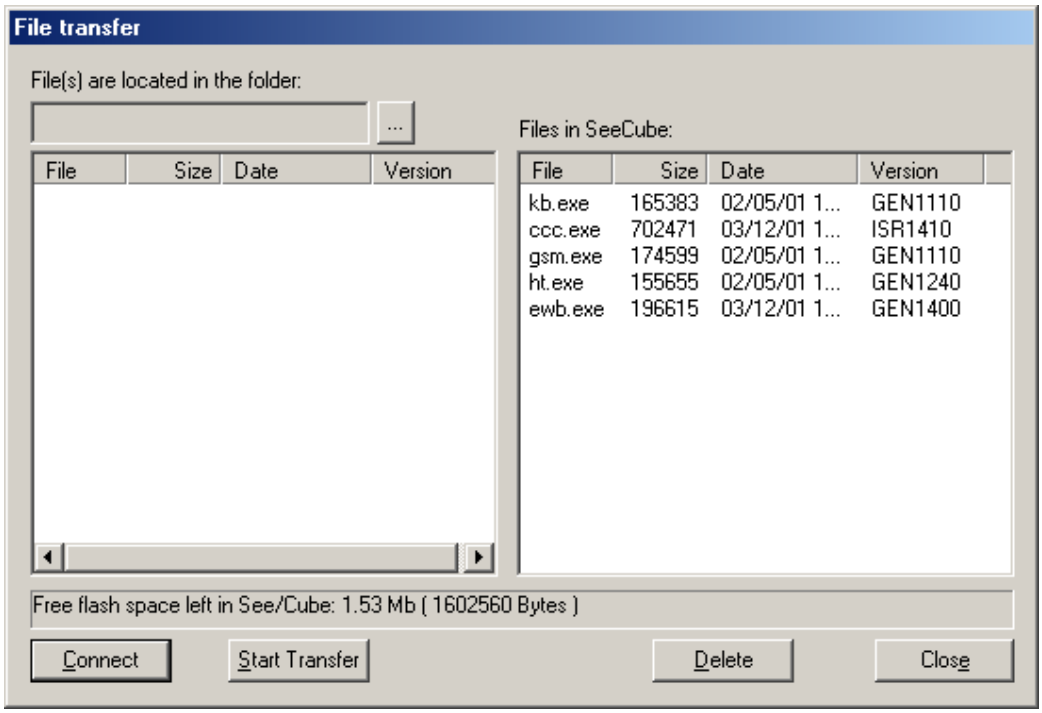
A red rectangle will appear on the image surface. This rectangle defines the active recognition zone. You can move it by mouse dragging with the left mouse button pressed.
You have to ensure that the car plate appears in this area from the moment the sensor was activated, and in all the possible car positions. (See Configuration settings for details how to update offset in C3 settings).

8.5.System calibration

This section is intentionally left open.

8.6.Software updates

To update executables files press "File transfer" button. An FTP style dialog box will appear. The right side will contain C3 files (after pressing the "Connect" button). The left side of the dialog is saved for new files that are downloaded to C3. Press browse button and explorer to the directory contains new files.



Before you start transfer a file be sure that its version is the recent C3 file with the same name. Only one file can be transfer each time.

By pressing "Delete" button you can delete one unnecessary files from the C3 memory.

NOTE:Like in the case of image transfer this can take some minutes, so be patient. Wait for message box with message of successful finish transformation.

8.7.Miscellaneous

8.7.1.System configuration settings

Press "Config.ini" button and on the configuration dialog press "Get settings" button. After few seconds current configuration will appear in the dialog fields.

8.7.1.1.MaxImages

The value is number of images captured for each light level.
Range: 1-3.
Default: 2.

8.7.1.2.MaxCycles

Stop condition for light levels. See LightMode for more details.
Range: 1-3.
Default: 3.

8.7.1.3.Threshold

Number of possible mistakes during comparing recognition results with numbers in database.
Range: 0-3.
Default: 1.

8.7.1.4.LightMode

Light management.
1 - low level only (MaxCycles parameter is ignored)
2 - medium level only (MaxCycles parameter is ignored)
3 - high level only (MaxCycles parameter is ignored)
4 - light level will be changed from low to high (if MaxCycles is 2 only two levels will
be used: low and medium)
5 - light level will be changed from high to low (if MaxCycles is 2 only two levels will
be used: high and medium)

Recommended value for front plate installation is 5 - "high to low" (with MaxCycles as 3).So the system will try to make recognition with high light level, after this with medium and after this with low. At each level the gate will open if there is a positive recognition, so most cases the first illumination level will suffice.

8.7.1.5.MaxLanes

If C3 was supplied with more than 1 lane you can make settings for these lanes.
The default value is 1.

8.7.1.6.Monitor

Set "0" for access control mode (this is the default if the parameter does not exist), or "1-100" for monitoring recognition grade threshold (the minimum mark for transmitting the result; the system stops the recognition cycle when passing this mark).

8.7.1.7.Sensor, Camera 1, Camera 2, Gate

These settings are made due to internal connections. Please do not make changes.

8.7.1.8.Send Result via COM port

Check the option if you want to send recognition results to external devices.
The baud rate of the results is 9600 and cannot be changed in current application version.

8.7.1.9.Format

You can format resulting string:

%C - sends recognized car code.
%F - sends first name of the person if was found in database.
%L - sends last name of the person.
%D - sends date in format mm/dd/yyyy
%T - sends time in format hh:mm:ss.
%A - if the recognition plate was found in database will send text of Text1 field.
%U - sends Text2 text if the recognition car code wasn't found in database.

In addition, command characters can also be output. For example: 13h - CR (type 0x0A) or 10h - LF (type 0x0d). Each other character entered to the format string will output as is.

Example: "0x0a0x0d %C %D" format string will be output:
(CR+LF)
1234567 03/15/2001

8.7.1.10.Image settings

Brightness.
Range: 1-255
Default: 127

Contrast.
Range: 1-127
Default: 100

Offset - offset recognition area from the top of image.
Range: 0-78
Default: 78 (= 3/4 bottom part of image is recognized)

The desired value can be measured on the captured image using the red rectangle display.

Press "Set settings" button to send changed settings to C3.

NOTE: Copy of config.ini file is saved automatically in application directory.

8.7.1.11.Miscellaneous

1) Press F12 key to view C3 time/date. If you want to correct the time (date), press "Set time / date" button on the dialog. The PC host time will be sent to C3.

2) When you exit the application, the C3 will restart and resume normal operation in about 30 seconds.

8.7.2.Error log file

If an internal error occurs during C3 work it saves its reference in the error.log file. Press "View Error log" button and press "Get" on the dialog. If an error log exists it will be transferred to the Dialog window. You can save it on PC host and contact us later.

Pressing "Delete" button will delete error.log in C3. Pressing "Clear" only empties dialog window.

8.7.3.Gsm error log file

If the C3 system was supplied with GSM interface (Siemens M20 Terminal), specific errors of this interface will be saved in gsm_err.log. Getting the log is the same like in the case of C3 error log.

8.7.4.Recognition format

The purpose of the format.ini file is for recognition performance. Please make changes in the file only after consulting with us.

8.7.5.Twb application log file

A log file is created and can be read.

The application saves a log file that contains all the operations you've done. The file name is "twb.log". You can see the file by pressing "twb.log" button on the application main window or open it by an editor from application directory. The file will be empty next time you start the application.

9.Interfacing the C3

9.1.Overview

The section describes how to prepare interface devices to work with C3. For operation details please refer to C3 User Manual.

9.2.MicroTerminal

9.2.1.Connection

A cable with six pin modular connectors and DB9 Female adapter is used to connect with C3. The MicroTerminal does not need an external Power Supply: Pin 9 of C3 DB9 connector is used to supply 5V DC and pin 5 for Ground.

9.2.2.Settings

The MicroTerminal settings are:

- Baud rate - 9600
- Data bits - 8
- Parity - even

Please refer to supplied MicroTerminal manual how to check and change the settings.

9.3.GSM Terminal

9.3.1.Safety precautions for the user

- Users are advised not to use the device in automotive service stations.
- Users are reminded of the necessity to comply with restrictions regarding the use of radio devices in fuel depots, chemical plants and locations where explosives are ignited.
- As is the case with other mobile radio transmitters, operating personnel are advised to use the device in the normal operation position only in order to ensure optimum performance and safety.
- If your M20 Terminal, your SIM card or both are lost, notify your network operator immediately in order to avoid misuse.

9.3.2.Components

1. M20 Siemens Terminal.
2. 3V small SIM card.
3. 9-pin serial cable for connection between C3 (PC host) and M20 Terminal.
4. Antenna cable with GSM antenna and fitting connector for connection with M20 Terminal's FME female antenna plug.

NOTES:

1. *Power supply is supplied from the C3 connection unit.*

2. *SIM cards are available from different network operators. The "calling number for 4800 Bits/s data transfer and SMS" service need be enable by local GSM provider/user agreement.*

9.3.3.Installation

Please refer to Getting started & Installation chapter of M20 Technical Description. After the SIM card was installed some default (manufactured) settings have to be changed. The PC host and HyperTerminal program is needed for this purpose.
The settings are:

1. Select SMS Message Format. Set text format.
   Command: AT+CMGF=1 (Reference: p.94 M20 technical description)
2. Show SMS Text mode Parameters.
   Command: AT+CSDH=1 (Reference: p.108 M20 technical description)
3. Set Fixed Local Rate (RS232 Baud rate). Set 9600 baud rate.
   Command: AT+IPR=9600 (Reference: p.53 M20 technical description)
   NOTE: After this command you have to change HyperTerminal baud rate to 9600 to continue operation.
4. Set Result Code Format mode.
   Command: ATV1 (Reference: p.42 M20 technical description)
5. Enable command echo. Do not echo characters received from terminal.
   Command: ATE0 (Reference:: p.38 M20 technical description)
   NOTE: After this command you will not see typing characters.
6. Store current parameter to user defined profile. All above parameters must be store in user defined profile.
   Command: AT&W0 (Reference: p.45 M20 technical description)
   NOTE: The user defined profile is stored in non-volatile memory.
7. If more than one GSM providers are available one of them has to be choused.
   Command: AT+CSCA= "service center address" (Reference: p.106)
8. Last parameter (service center address) must be stored to SIM card.
   Command: AT+CSAS. (Reference: p.106 M20 technical description)

Stored configuration is automatically downloaded each time the system is started up.

10.Trouble Shooting

This section will provide hints on potential problems during installation.

11.Support and more Information

You can contact us for more information and assistance at:

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Quote: On the plains of hesitation lie the blackened bones of countless millions who at the dawn of victory lay down to rest, and in resting died.

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